Supplemental Document

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Polarization-sensitive optical coherence tomography in end-stage lung diseases: an ex vivo pilot study: supplement

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Supplementary material

In this document, two additional pullbacks showing airway smooth muscle (ASM) segmentation are used to illustrate the manual alignment of the two pullbacks and the repeatability of the measurement. Furthermore, attenuation coefficient (AC) images are compared to conventional intensity images for all lung types imaged.

Manual alignment and repeatability

Figure 1 shows the ASM segmentation of a healthy lung airway. The two pullbacks do not start at exactly the same location in the lung, because the catheter was inserted deeper in pullback 1. Furthermore, it can be observed that the speed between the two pullbacks was not the same as the distance between the peaks increases with frame number (Figure 1A). After manual alignment of the peaks, the amount of ASM segmented is the same (Figure 1B).

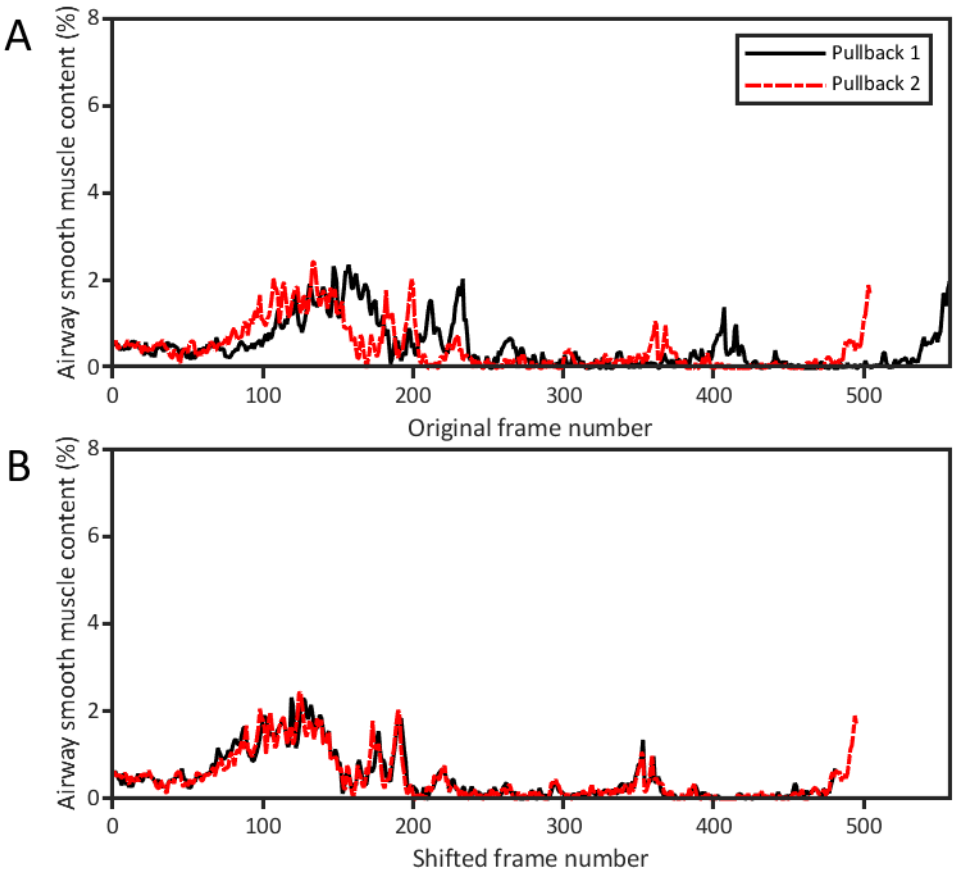

Figure 1. Airway smooth muscle (ASM) segmentation of a healthy lung airway. A) shows the original signals, B) shows the results after manual alignment.

The difference between the mean of these pullbacks is 0.48 % - 0.46 % = 0.02 %. The relative percent difference between the means is 5.3%. After manual alignment of the peaks, the mean difference per frame was 0.12% ± 0.02%. The mean and median of the relative percent difference per frame were 58% and 32%, respectively.

Figure 2 shows the ASM segmentation of a fibrotic sarcoidosis lung airway. Here it can be observed that the second pullback was consistently higher in reported ASM value.

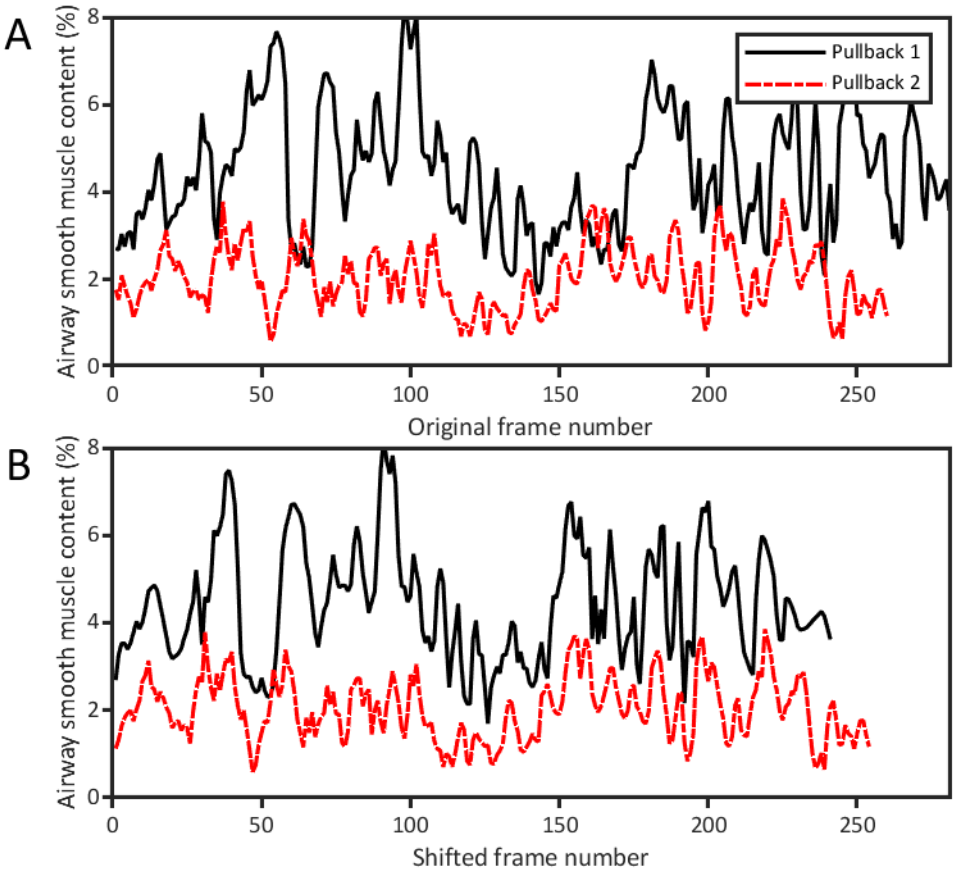

Figure 2. Airway smooth muscle (ASM) segmentation of a fibrotic sarcoidosis airway. A) shows the original signals, B) shows the results after manual alignment.

The difference between the mean of these pullbacks is 4.43% - 2.06% = 2.37%. The relative percent difference between the means is 73%. After manual alignment of the peaks, the mean difference per frame was 2.37% ± 1.13%. The mean and median of the relative percent difference per frame were both 73%.

Intensity vs AC

Figure 3 shows the intensity images and their corresponding AC images of all six lung types. All AC images except Figure3J (fibrotic sarcoidosis) are shown in the main manuscript combined with their histology images.

It can be seen that the attenuation coefficient images show the same features as the intensity images close to the lumen, and provide more contrast further away from the lumen. Shadowing artefacts (red arrows) are mitigated in the AC images.

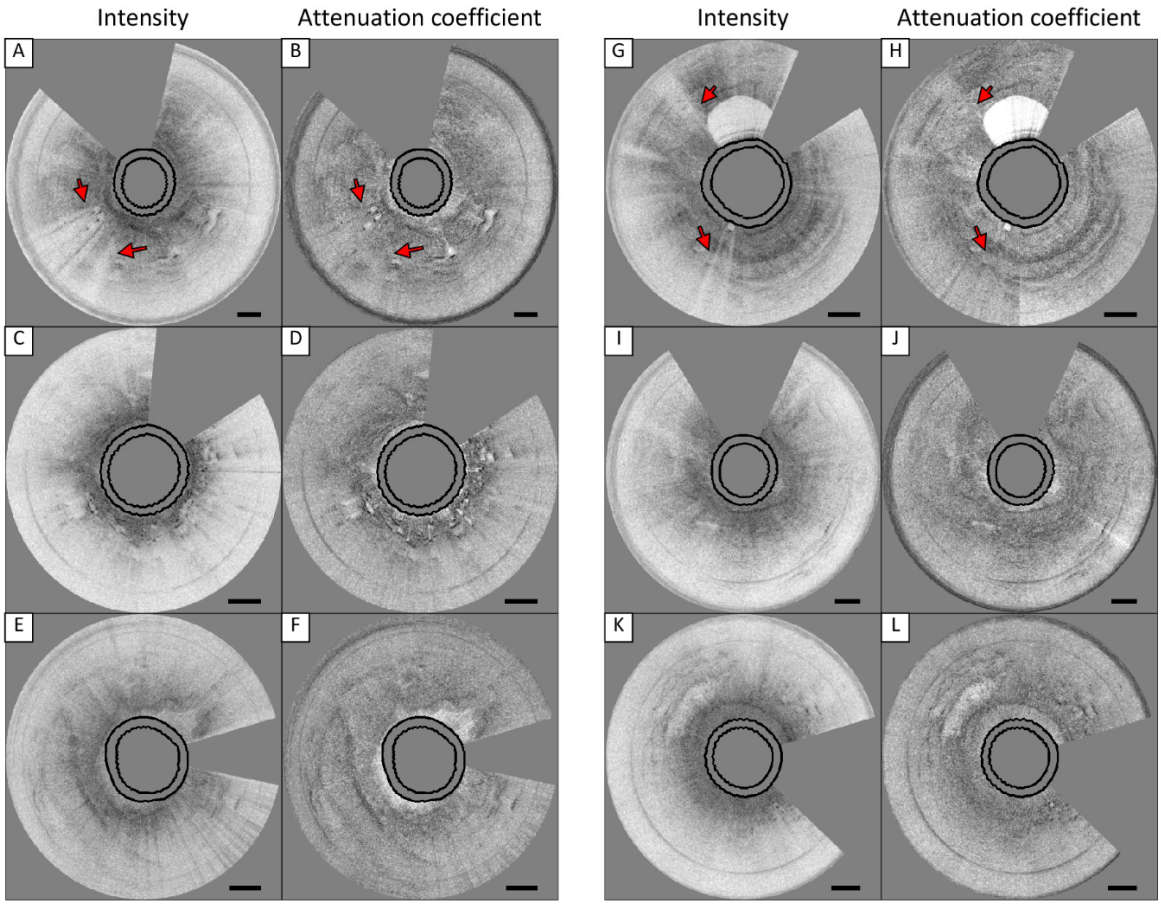

Figure 3. Intensity images (A,C,E,G,I,K) and their corresponding attenuation coefficient (AC) images (B,D,F,H,J,L) for healthy lung 1 (A, B), healthy lung 2 (C,D), COPD (E,F), fibrotic hypersensitivity pneumonitis (G,H), fibrotic sarcoidosis (I,J) and cystic fibrosis (K,L). Red arrows point to shadowing artefacts in the intensity images, and their corresponding locations in the AC images.